

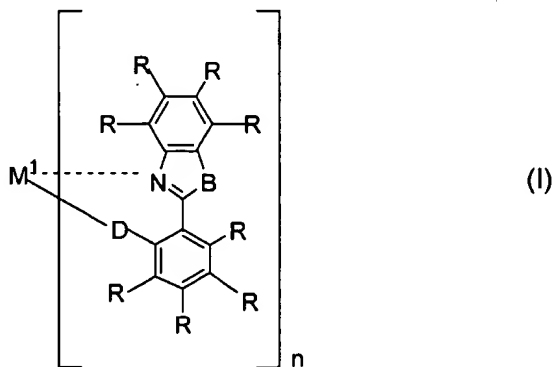
## **REMARKS**

The Applicants have carefully reviewed the Examiner's Office Action dated October 1, 2003, which rejects claims 1 to 4 under 35 U.S.C. 103(a) as being unpatentable over Shi (USP No. 6,083,634) in view of Shi et al. (USP No. 5,755,999). However, for the reasons provided below, early allowance of pending claims 1 to 6 is respectfully requested.

Antecedent support for new claims 5 and 6 is provided by original claim 1, from which each of the added claims depends.

### **I. Critical Feature of the Present Invention**

By way of review, the present invention, defined in pending claims 1, 5 and 6, is directed to an organometallic luminescent material of formula (I); and claims 2 to 4, to an electroluminescent device comprising an organic luminescent layer containing said organometallic luminescent material:



wherein,

$M^1$  is a monovalent or tetravalent metal selected from the group consisting of Li, Na, K, Zr, Si, Ti, Sn, Cs, Fr, Rb, Hf, Pr, Pa, Ge, Pb, Tm and Md;

R is hydrogen or C<sub>1-10</sub> alkyl;

B is O, S, Se or Te;

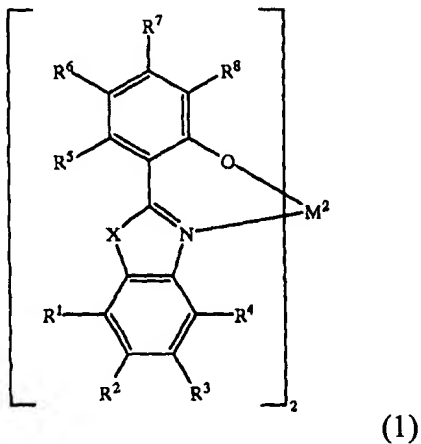
D is O or S; and

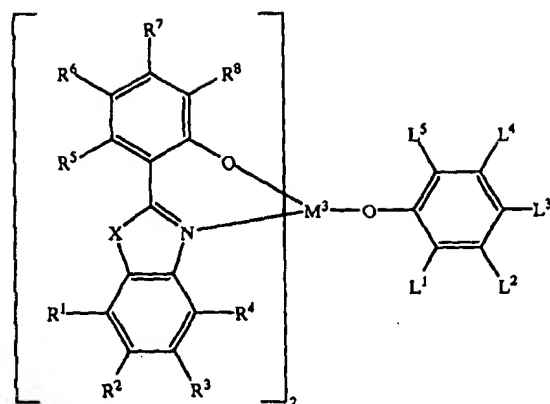
n is an integer ranging from 1 to 4.

The compound of formula (I) of the present invention which is capable of emitting pure blue and thermally stable light, which can be advantageously used in a luminescent layer to provide a bright blue-emitting device having high thermal stability and improved luminous efficiency.

## II. Summary of the Cited References

The Shi ('634) patent, cited as a primary reference by the Examiner, discloses an organometallic luminescent material of formula (1) or (2) and an electroluminescent device comprising same:





(2)

wherein,

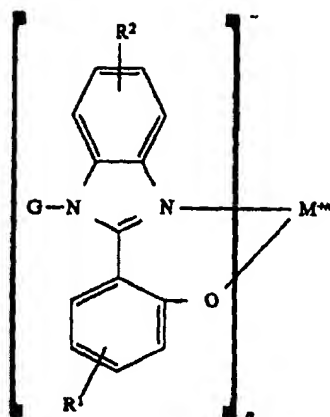
$M^2$  is a divalent metal;

$M^3$  is a trivalent metal;

X represents O, S, NH or  $CH_2$ ; and

$R^1$  to  $R^8$  and  $L^1$  to  $L^5$  represent each independently hydrogen, hydrocarbon, cyano, halogen, haloalkyl, haloalkoxy, alkoxy, amido, amino, sulfonyl, carbonyl, carbonyloxy, or oxycarbonyl, with the provision that  $L^1$  and  $L^2$  or  $L^2$  and  $L^3$  together can form a fused benzo ring.

In addition, the Shi ('999) patent, cited as a secondary reference by the Examiner, relates to an organometallic luminescent material of formula (3):



(3)

wherein,

M is a divalent or trivalent metal;

G is a C<sub>6-24</sub> aryl or heteroaryl group optionally having one or more substituents selected from the group consisting of C<sub>1-8</sub> alkyl, C<sub>1-8</sub> haloalkyl, C<sub>1-18</sub> alkoxy, C<sub>1-18</sub> haloalkoxy, halogen, cyano, amino, amido, sulfonyl, carbonyl, aryl and heteroaryl;

R<sup>1</sup> and R<sup>2</sup> are each independently C<sub>1-18</sub> alkyl, C<sub>1-18</sub> haloalkyl, cyano, halogen, amido, amino, sulfonyl, carbonyl or 5-24 carbon atoms necessary to complete a fused aromatic ring; and

n is an integer of 2 or 3.

### **III. Comparison of the Present Invention with the Cited References**

The Examiner pointed out that as the organometallic complex disclosed in the Shi ('634) patent has the same ligand as that of formula (I) of the present invention, although the metal is a divalent or trivalent metal. [In that regard Shi ('634) actually teaches away from Applicants' claimed invention.] The Shi ('999) patent teaches an organometallic complex comprising a monovalent, divalent or trivalent metal, such as Li, Na and K. The Examiner alleges that the inventive compound of formula (I) is simply suggested by

combining the two patents.

Moreover, G is a significant part of Shi's ('999) structure, which has not been evaluated with regard to resulting properties. To disregard G is in direct conflict with Shi's ('999) teachings.

Please note that a monovalent metal, such as Li, Na and K, which appears on column 34, lines 44 to 67, and column 35, lines 1 to 5, of the Shi ('999) specification belongs to an electron transporting material, and forms a metal chelated oxinoid compound having a structure entirely different from the above-mentioned luminescent materials.

Therefore, it is believed that the cited primary and secondary references both are entirely silent on the inventive organometallic luminescent material containing a monovalent or tetravalent metal selected from the group consisting of Li, Na, K, Zr, Si, Ti, Sn, Cs, Fr, Rb, Hf, Pr, Pa, Ge, Pb, Tm and Md. Furthermore, as seen from the pamphlet ("Organic Materials for Display Applications") issued by Galena American Dye Source, Inc., on February 15, 2003, which is submitted together with this response, complexes emitting blue color (page 10) contain a lithium metal which does not participate in coordinate bonding, and, therefore, such boron-coordinated lithium compounds are basically different from the inventive complex.

Further, the luminescent material of the present invention emits pure blue light, providing an organic electroluminescent device with high purity blue color when used in a luminescent layer, as is supported by the spectrum (FIGs. 2 and 4) and CIE color coordinate results (FIG. 5) in Examples 1, 2 and 3 of the present specification using 2-(2-hydroxyphenyl)benzoxazole-lithium complex. Most of all, in FIG. 5, the CIE color coordinate of the multi-layered OLED prepared in Preparation 6 is  $x=0.15$  and  $y=0.08$  at above  $10,000 \text{ cd/m}^2$ , which is the nearest value to the NTSC standard value of

$x=0.14$  and  $y=0.08$ , and means that the inventive device can indeed emit blue color of high purity.

The luminescent material, i.e., 2-(2-hydroxyphenyl)benzoxazole-zinc complex, disclosed in the Shi ('634) patent, on the other hand, when used in a luminescent layer, emits bluish-green light which is near the boundary (on the CIE 1931 chromaticity diagram) between green and bluish-green (not pure blue light) as taught in Example 4 of the Shi ('634) specification, and, therefore, the Shi ('634) patent does not provide the superior effect achievable by the present invention.

Obviousness requires a suggestion of all limitations in a claim. *CFMT Inc. v. Yieldup International Corp.*, 68 U.S.P.Q. 2d 1940, 1947 (Fed. Cir. 2003).

#### Non-obviousness over the combination of the cited references

As described above, it is believed that the unique feature of the present invention as well as beneficial effects arising therefrom are not taught, suggested or implied by the cited references, even if they are combined. Therefore, the present invention defined in claims 1 to 6 is clearly patentable and unobvious over the cited references.

With regard to combining references, kindly note the opinion for *In re Lee*, 61 U.S.P.Q. 2d 1430 (Fed. Cir. 2002), at 1432 and 1433:

"The factual inquiry whether to combine references must be thorough and searching." It must be based on objective evidence of record. This precedent has been reinforced in myriad decisions and cannot be dispensed with. "[P]articular findings must be made as to the reason the skilled artisan, with no knowledge of the claimed invention, would have selected these components for combination in the manner claimed". The Examiner can satisfy the burden of showing obviousness of the combination "only by showing some objective teaching in the prior art or that knowledge generally available to one of ordinary skill


in the art would lead that individual to combine the relevant teachings of the references". The Board rejected the need for "any specific hint or suggestion in a particular reference" to support the combination of the two references. Omission of a relevant factor required by precedent is both legal error and arbitrary agency action.

#### IV. Conclusion

In view of the foregoing discussions, it is respectfully submitted that the present invention as defined in the pending claims 1 to 6 is not anticipated by or obvious over the disclosures contained in the references relied upon by the Examiner, either alone or in combination, and, therefore, it is earnestly requested that the Examiner's rejection be withdrawn and that the pending claims be allowed in their present form.

Respectfully submitted,

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